

## SECTION 02445

### BOUNDARY FENCES

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#### **LANL MASTER CONSTRUCTION SPECIFICATION**

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the ESM Civil POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within "stars" during editing.

Coordinate with Standard Detail ST-G2040-2, Fences.

Specification developed for ML-3 / ML-4 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.

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#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Wire, posts, and accessories.
- B. Pedestrian and vehicle gates.
- C. Concrete.
- D. Electrical grounding.

##### 1.2 LANL PERFORMED WORK

- A. Layout fence lines, gates, and terminal posts with suitable stakes (at intervals not exceeding 500 feet or line of sight).
- B. Layout utility lines, USC&G benchmarks, property monuments, and other underground structures with suitable stakes.
- C. Obtain excavation/soil disturbance permit for Contractor.

##### 1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01330, Submittal Procedures:
  - 1. Catalog data on fabric, posts, accessories, fittings and hardware.

2. Two legible copies of batch tickets for each load of concrete to the LANL Construction Inspector.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle structural steel without damaging finish.
- B. Deliver manufactured materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- C. Store materials off ground, under cover, and away from damp surfaces.
- D. Remove damaged unlabeled or unsatisfactory materials that do not meet this specification from the job site.

#### 1.5 QUALITY ASSURANCE

- A. Comply with the following unless otherwise noted.
  1. Federal Specification RR-F (<http://stinet.dtic.mil/>)

191/4D	Accessories
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  2. ASTM International

ASTM A116	Stays
ASTM A569	Angles, braces
ASTM A641	Wire
ASTM A702	T-beam posts
ASTM F900	Gate Construction

### PART 2 PRODUCTS

#### 2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Alternate products may be accepted; follow Section 01630, Product Options and Substitutions.

## 2.2 PRODUCT MATERIALS

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If allowed by RRES-ECO via Standards Civil POC, 12 1/2 gauge barbed wire can be substituted.

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### A. Fencing:

1. Angles, posts, braces and wire shall be steel. Bolts, hardware and other parts shall be steel, malleable iron or ductile iron.

### B. Fencing Materials:

1. Wire: [ASTM A641 smooth] [A121 barbed] with a Class 1 zinc coating. Wire shall consist of [one] [two] strand of No. [9 single] [12 1/2 double barbed] gauge copper-bearing steel wire [with large four point hard temper round barbs spaced approximately 5 inches apart (design 12-4-5-14R)].
2. Tie wires for fastening wire to steel posts: No. 12 gauge copper-bearing steel wire. Tie wires shall be heavily galvanized by the hot-dip process.
3. Stays: No. 9-1/2 gauge copper-bearing steel wire conforming to the requirements of ASTM A116. Stays shall be 42 inches long.

### C. Angles, Posts and Braces:

1. Angles and braces shall be fabricated from rail, billet or commercial grade steel per ASTM A569. T-beam section posts shall be fabricated from rail, billet or commercial grade steel per ASTM A702. Angles and braces shall be galvanized by the hot-dip process after fabrication. Angles and braces per ASTM A569 shall be triple coated with a minimum of 0.9 ounces per square foot of zinc, 15 micrograms per square inch of chromate and 0.3 mils of polyurethane finish. T-beam section line posts per ASTM A702 shall be painted with three (3) coats of an anti-corrosive aluminum paint or suitable substitute to prevent corrosion.
  - a. Corner and intermediate brace posts and braces shall be angles of the dimensions and length indicated on the Drawings.
  - b. Line posts shall have a minimum weight of 1.33 pounds per foot excluding the anchor plates. Line posts shall be T-beam sections of the length indicated on the Drawings. Line posts shall have corrugations, ribs or notches spaced at approximately one inch on center to hold the fence wire in the spacing designated on the Drawing. Anchor plates shall have a minimum of 18 square inches of area and shall weigh not less than 2/3 pounds each. They shall be welded or riveted to the section so as to prevent displacement when the posts are driven.

D. Fittings:

1. Fittings, hardware and appurtenances for fences shall be commercial quality steel, malleable iron or wrought iron galvanized per ASTM A153.

E. Gates:

1. Gate fabric shall be No. 11 gauge copper bearing open-hearth steel wire, woven in a 2-inch mesh, and heavily galvanized by the hot-dip process after weaving. Gates shall be 4-feet high and shall be furnished with pivot-type hinges and center stop. Gates shall provide clear openings as shown on drawings. Latches are required only if called out for in the contract.

2. Gate Posts:

- a. Gate Leaf - Widths up to 6 feet: 2-1/2 inch Schedule 40.
- b. Gate Leaf - Widths up to 12 feet: 3-1/2 inch Schedule 40.
- c. Gate Leaf - Widths up to 18 feet: 6 inch Schedule 40.
- d. Gate Leaf - Widths up to 23 feet: 8 inch Schedule 40.

3. Gate Frames

- a. Gate Leaf - Widths Less than 10 feet: 1-1/2 inch Schedule 40.
- b. Gate Leaf - Widths 10 Feet to 16 feet: 2 inch Schedule 40.
- c. Gate Leaf - Widths Greater than 16 feet: 2 inch Schedule 80.

## 2.3 FENCE GROUNDING

- A. Grounding Cable: No 4/0 AWG bare, stranded, soft temper copper cable conforming to ASTM B8, Standard Specification for Concentric-Lay stranded Copper Conductors.
- B. Flexible Braid: Tinned copper braid with tinned copper ferrules; minimum 250 ampere rating; 12 inch minimum length. O-Z/Gedney Type FB.
- C. Cable to Pipe Clamps: NRTL (National Recognized Testing Laboratory) listed copper alloy connectors with silicon bronze hardware for making cable to pipe connections. O-Z/Gedney Type ABG 1-1/2 inch and smaller, Type CG 2 inch and larger pipe diameter.
- D. Flexible Braid to Pipe Clamps: NRTL listed copper alloy connectors with silicon bronze hardware for making braid or copper bar to pipe connections. O-Z/Gedney Type RG.

## 2.4 CONCRETE

- A. Provide minimum 28-day strength of 2500 psi.

## PART 3 EXECUTION

### 3.1 SITE PREPARATION

- A. Notify LANL Construction Inspector 10 days prior to start of construction to identify known utilities and stake and flag locations.

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Specify site specific clearing and grading requirements in the specification or on the drawings.

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- B. Before installing fence, perform site clearing and grading as noted on Drawings.
- C. Allow footing to cure minimum 7 days before installing fabric and other materials.

### 3.2 GENERAL REQUIREMENTS

- A. Once in place, peen or spot-weld gate hardware to prevent easy removal.
- B. Coat damaged galvanized finish with zinc-enriched paint.
- C. Leave area of installation neat and free of debris caused by erection of fence.

### 3.3 ELECTRICAL GROUNDING

- A. Bond gateposts on both sides of gate openings using direct buried grounding cable and cable to pipe clamps. Bond gateposts to gates using flexible braid and flexible braid to pipe clamps. Ground posts on both ends of gates; steel posts set in concrete will be considered as adequately grounded.
- B. Ground permanent metallic fences crossed by overhead power at every third post for a distance of 50 feet from the crossing; chain link fences with steel post set in concrete will be considered as adequately grounded.
- C. Ground metal fences surrounding substations and switching stations to station ground system in accordance with the National Electrical Safety Codes and IEEE Std. 80.

### 3.4 EXCAVATION, BACKFILL, AND COMPACTION

- A. Refer to Section 02310.

### 3.5 INSTALLATION

#### A. Concrete:

1. Concrete foundations for intermediate brace posts and corner posts shall be circular in horizontal section, not less than the angle dimension plus 9 inches in diameter and 3'-6" deep. Concrete foundations for braces shall be circular in horizontal section, not less than 24 inches in diameter and 12 inches deep.
2. Where the Drawings require that posts and braces be embedded in concrete, install temporary guys or braces such that posts and braces will be held in the proper position until the concrete has set sufficiently to hold them in the proper position. No materials shall be installed on posts and braces set in concrete and no strain shall be placed on guys or bracing until seven days have elapsed from the time of placing the concrete. Ensure that the concrete has sufficiently cured prior to pulling the wire.

#### B. Posts:

1. All corner posts, line posts and intermediate brace posts shall be set plumb and shall be spaced in the line of the fence not to exceed 16-foot centers. All posts shall be set or driven to a depth not less than 36 inches.
  - a. Metal line posts may be driven.
  - b. Corner and intermediate brace posts shall be set in concrete.
  - c. Intermediate brace posts shall be placed at intervals not less than 100 feet and not more than 600 feet and shall be spaced evenly between corner and gate posts.

#### C. Wire:

1. Stretch fence wire by mechanical stretcher or other devices designed for this use. Stretching by motor vehicle will not be permitted. The length between pull posts shall not exceed 100 feet.

#### D. Stays:

1. Stays shall be twisted into place in accordance with the manufacturer's written instructions at the spacing indicated in the Drawings.

#### E. Bolts and Hardware:

1. All nuts, bolts and tie wires shall be securely fastened to deter theft and vandalism and shall be placed to assure visual evidence of tampering.

F. Painting:

1. Surfaces that have been cut or filed or surfaces where the galvanized coating has been broken or damaged shall be painted with three coats of an anti-corrosive aluminum paint or suitable substitute to prevent corrosion.

G. Clearance:

1. Provide suitable closures approved by the Engineer at irregularities in grade such as curbs or ditches. Vertical posts shall not exceed 6 inches open space to the adjacent post or solid structure.

END OF SECTION

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Do not delete the following reference information:

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FOR LANL USE ONLY

This project specification is based on LANL Master Construction Specification Rev. 0, dated December 5, 2002.